

HETEROSCYLLIUM, nom. nov.

Brachælurus (non Ogilb. 1906), Ogilb. Proc. R. Soc. Queensland, xxi. 1907, p. 3.

BRACHÆLURUS.

Brachælurus, Ogilb. Proc. R. Soc. Queensland, xx. 1906, p. 27; Regan, Proc. Zool. Soc. 1908, p. 354.

Cirriscyllium, Ogilb. Proc. R. Soc. Queensland, xxi. 1907, p. 4.

Heteroscyllium colcloughi, described by Mr. Ogilby from Queensland, seems to differ generically from *Brachælurus modestus* in the less depressed head and more inferior mouth, but especially in having the anal fin separated from the caudal by a distinct interspace (rather more than $\frac{1}{2}$ the length of its base).

LX.—A Collection of Freshwater Fishes made by Mr. C. F. Underwood in Costa Rica. By C. TATE REGAN, M.A.

Characinidæ.

1. *Tetragonopterus æneus*, Günth.

Rio Iroquois (Atlantic Slope) and Rio Grande de Terraba.

2. *Tetragonopterus scleroparius*, sp. n.

Tetragonopterus fasciatus (part.), Günth. Cat. Fish. v. p. 322 (1864).

Tetragonopterus petencensis (part.), Günth. t. c. p. 326.

Tetragonopterus sinus (part.), Bouleng. Boll. Mus. Torino, xiii. 1898, no. 329, p. 2.

Depth of body $2\frac{1}{2}$ to 3 in the length, length of head $3\frac{2}{3}$ to $4\frac{1}{2}$. Snout shorter than eye, the diameter of which is 3 to $3\frac{1}{2}$ in the length of head; interorbital width about $2\frac{1}{2}$ in the length of head. Maxillary extending to the vertical from anterior edge of eye; 2 to 5 maxillary teeth. Suborbitals broad, the lower edge of the second in contact with the lower limb of the præoperculum. 10 to 12 gill-rakers on the lower part of the anterior arch. 36 to 41 scales in a longitudinal series, 6 or 7 in a transverse series from origin of dorsal fin to lateral line, 5 to 7 between lateral line and base of pelvic fin. Dorsal 10–11; origin behind the pelvics; longest ray shorter than the head; free edge a little convex. Anal 27–32, with 24 to 28 branched rays; origin below end of

base of dorsal; free edge emarginate; length of base $\frac{1}{3}$ or less than $\frac{1}{3}$ the length of the fish. Pectorals extending to the pelvics, which reach the vent. Silvery, back darker; no humeral spot; a plumbeous lateral band ending in a blackish spot which extends to the end of the middle caudal rays.

Rio Iroquois.

Eleven specimens, 70 to 125 mm. in total length.

Five specimens from Western Ecuador (*Fraser*) should be referred to this species, and it is probable that the two small specimens from Panama (*Bransford*), recorded by Eigenmann and Ogle as *T. emperador*, also belong to *T. scleroparius*.

The name *Tetragonopterus simus* may be restricted to a species which differs from the one described above in the smaller eye ($\frac{2}{7}$ the length of head in a specimen of 72 mm.), the longer anal fin (extending forward to below the dorsal and measuring a little more than $\frac{1}{3}$ the length of the fish), and the absence of a well-defined black caudal spot.

Closely allied to *T. simus* is *T. microphthalmus*, Günth., from Peru, which resembles *T. simus* in the small eye, but agrees with *T. scleroparius* in the extent of the anal fin and the presence of a black caudal spot.

3. *Tetragonopterus emperador*.

Astyanax emperador, Eigenm. & Ogle, Proc. U.S. Nat. Mus. xxxiii. 1907, p. 26.

Depth of body $2\frac{3}{5}$ to $2\frac{4}{5}$ in the length, length of head 4. Snout shorter than eye, the diameter of which is 3 to $3\frac{1}{2}$ in the length of head; interorbital width $2\frac{1}{2}$ to $2\frac{2}{3}$ in the length of head. Maxillary extending to below anterior $\frac{1}{4}$ of eye; 2 to 4 maxillary teeth. Suborbitals broad, the lower edge of the second in contact with the lower limb of the præoperculum. 11 gill-rakers on the lower part of the anterior arch. 46 to 49 scales in a longitudinal series, 8 to 10 in a transverse series from origin of dorsal fin to lateral line, 7 or 8 between lateral line and base of pelvic fins. Dorsal 10-11; origin behind the pelvics; longest ray shorter than the head; free edge straight or convex. Anal 28-30, with 25-27 branched rays; origin below or behind end of base of dorsal; free edge emarginate; length of base less than $\frac{1}{3}$ the length of the fish. Pectorals extending to the pelvics, which nearly or quite reach the anal. Silvery, back darker; humeral spot faint; caudal spot extending on to the fin, but not to the end of the middle rays.

Rio Grande de Terraba.

Three specimens, 90 to 105 mm. in total length.

This species was hitherto known only from a single small specimen (52 mm.) from Panama.

Siluridæ.

4. *Arius evermanni*, Gilb. & Starks.

Depth of body 5 in the length, length of head $3\frac{2}{3}$ to $3\frac{3}{4}$. Breadth of head $1\frac{2}{3}$ in its length, diameter of eye $6-6\frac{1}{2}$. Fontanel produced into a groove which does not reach the parieto-occipital; parieto-occipital with a feeble keel anteriorly, which does not extend on to the occipital process, which is broader than long, with straight or concave sides and truncate or emarginate apex; dorsal shield small, sub-crescentic. Width of mouth nearly $\frac{1}{2}$ the width of head; præmaxillary band of teeth 4 times as long as broad; teeth on the palate obtusely conical, in two rather large subovate patches which are not very widely separated anteriorly; maxillary barbel not quite reaching the base of pectoral. 11 gill-rakers on the lower part of the anterior arch. Dorsal I 6-7; spine a little less than $\frac{2}{5}$ the length of head; adipose fin shorter than the dorsal. Anal 21-22. Pectoral spine $\frac{3}{5}$ or nearly $\frac{3}{5}$ the length of head, with the inner edge rather strongly serrated. Silvery; back bluish grey; fins more or less dusky.

Rio Ballena (Pacific Slope).

Two specimens, 230 to 270 mm. in total length.

This species differs from *A. fuerthii* in the longer head, shorter barbels, shorter fin-spines, and more strongly serrated pectoral spines.

5. *Rhamdia wagneri*, Günth.

Rio Ballena.

Cyprinodontidæ.

6. *Gambusia rhabdophora*, sp. n.

Depth of body $3\frac{1}{4}$ to $3\frac{3}{4}$ in the length, length of head $3\frac{3}{4}$ to 4. Snout as long as or shorter than eye, the diameter of which is $3\frac{1}{2}$ to 4 in the length of head; interorbital width equal to the distance from middle of eye to free edge of operculum. 27 or 28 scales in a longitudinal series. Dorsal 8-10; origin equidistant from end of snout and posterior part or posterior edge of caudal fin. Anal 9; origin below anterior $\frac{1}{4}$ of dorsal; first branched ray the longest. Pectoral

$\frac{3}{4}$ the length of head. Caudal subtruncate. Least depth of caudal peduncle $\frac{2}{3}$ the length of head. Scales with dark edges; a series of short dark vertical bars along the middle of the side; dorsal fin with 2 or 3 series of dark spots.

Volcano of Tenorio and Rio Grande de Terraba.

Nine specimens, 40 to 50 mm. in total length.

Allied to *G. episcopi*, Steind., *G. annectens*, Regan, and *G. terrabensis*, Regan, differing from the two first-named especially in the more posterior position of the anal fin, and from the last in the fewer dorsal fin-rays.

PETALOSOMA, gen. nov.

Differs from *Gambusia* in having the lower surface of the tail, behind the anal fin, compressed to a sharp edge.

7. *Petalosoma cultratum*, sp. n.

Body strongly compressed, its depth $3\frac{1}{3}$ in the length, length of head 4. Snout nearly as long as eye, the diameter of which is 3 in the length of head and a little less than the interorbital width. 35 scales in a longitudinal series. Dorsal 8; origin equidistant from eye and posterior edge of caudal fin. Anal 9, far in advance of the dorsal; first branched ray the longest. Pectoral shorter than the head; pelvics inserted below the middle of pectoral and extending to the anal. Olivaceous; a dark linear lateral stripe on the posterior part of the body.

Rio Iroquois.

A single specimen (σ), 50 mm. in total length.

8. *Pæcilia sphenops*, Cuv. & Val.

Volcano of Tenorio.

9. *Pæcilia retropinna*, sp. n.

Depth of body $3\frac{1}{2}$ in the length, length of head $4\frac{1}{2}$. Snout as long as eye, the diameter of which is $3\frac{1}{2}$ in the length of head. Interorbital width equal to the distance from middle of eye to free edge of operculum. 30 scales in a longitudinal series. Dorsal 9; origin equidistant from anterior part of eye and posterior edge of caudal fin; free edge straight, the first branched ray the longest. Anal 10; origin a little in advance of that of the dorsal. Pectoral nearly as long as the head, extending to the base of the pelvics. Caudal rounded. Least depth of caudal peduncle $\frac{3}{4}$ the length of head. Olivaceous; scales with darker edges; fins pale.

Boruca.

A single specimen (♀) 77 mm. in total length.

Closely allied to *P. elongata*, in which the origin of the dorsal fin is equidistant from the end of the snout and the posterior edge of the caudal, or nearer the former, the pectoral extends to above the middle of the pelvics, and the interorbital width is not more than the distance from the posterior margin of the pupil to the free edge of the operculum.

10. *Pæcilia tropica*, Meek.

Depth of body $2\frac{1}{5}$ to $3\frac{1}{4}$ in the length, length of head $3\frac{2}{3}$ to $4\frac{1}{4}$. Snout shorter than eye, the diameter of which is $2\frac{3}{4}$ to 3 in the length of head. Interorbital width equal to the distance from middle of eye to free edge of operculum. 26 to 29 scales in a longitudinal series. Dorsal 9-10; origin equidistant from end of snout and middle (♀) or basal part (♂) of caudal fin; first branched ray (♀) or posterior rays (♂) the longest, the fin elevated in the male. Anal 9-10; origin a little behind that of the dorsal; first branched ray the longest. Pectoral as long as the head, extending nearly to the middle of the pelvics (♀). Caudal subtruncate. Least depth of caudal peduncle $\frac{3}{4}$ (♀) to $\frac{7}{8}$ (♂) the length of head. Olivaceous; dorsal with black spots, the basal half of the fin sometimes uniformly blackish; caudal with or without small blackish spots; sometimes a blackish blotch at the base of the caudal fin.

Rio Iroquois.

Six specimens, 60 to 100 mm. in total length.

This species differs from *P. sphenops* and agrees with *P. salvatoris* in the shape of the dorsal fin; it differs from the latter in the larger eye.

The synopsis of the Central American species of *Pæcilia* given in the 'Biologia Centrali-Americana' may be modified as follows, in order to include the species since described* :—

I. Origin of anal in advance of that of the dorsal.

A. Anal 7. 26 scales in a longitudinal series. [1866.

1. *spilurus*, Günth.,

B. Anal 8-11.

1. Dorsal rounded, the middle rays the longest; 27 to 30 scales in a longitudinal series 2. *occidentalis*, Baird & [Girard, 1853.

* This synopsis is based on female specimens only; in some species the males have not yet been described. They differ from the females in having the anal fin advanced and modified into an intromittent organ, whilst the dorsal is a little further forward, more or less elevated, and often differently shaped.

2. Dorsal with free edge nearly straight, the first branched ray the longest.

Origin of dorsal equidistant from end of snout and posterior edge of caudal fin, or nearer the former; pectoral extending to above middle of pelvics; 30 to 33 scales in a longitudinal series [1866.
3. *elongata*, Günth.,

Origin of dorsal nearer to posterior edge of caudal fin than to end of snout; pectoral extending to base of pelvics; 30 scales in a longitudinal series 4. *retropinna*, sp. n.

II. Origin of anal below or a little behind that of the dorsal; origin of dorsal nearer to base of caudal fin than to end of snout.

A. Depth of body $2\frac{3}{4}$ to $3\frac{3}{4}$ in the length; 26 to 30 scales in a longitudinal series.

Dorsal 8-11, rounded, the middle rays the longest [1846.
5. *sphenops*, Cuv. & Val.,

Dorsal 8-9, with the free edge a little convex, the anterior branched rays the longest; eye small, its diameter $3\frac{1}{4}$ to $3\frac{2}{3}$ in the length of head (in specimens of 32 to 52 mm.) .. 6. *silonota*, sp. n.*

Dorsal 10-11, with the free edge straight, the first branched ray the longest; eye rather small, its diameter $3\frac{1}{4}$ in the length of head (in specimens of 55 mm.) [1907.
7. *salvatoris*, Regan,

Dorsal 9-10, with the free edge straight, the first branched ray the longest; eye large, its diameter $2\frac{3}{4}$ to 3 in the length of head (in specimens of 60 to 100 mm.) 8. *tropica*, Meek, 1907.

B. Depth of body 4 to $4\frac{1}{2}$ in the length; 31 scales in a longitudinal series 9. *tenuis*, Meek, 1907.

* *Pacilia silonota*, sp. n.

Pacilia sphenops (part.), Regan, Biol. Centr.-Am., Pisc. p. 102, t. xiii. fig. 2 (1907).

Depth of body 3 to $3\frac{2}{3}$ in the length, length of head $3\frac{2}{3}$ to 4. Snout shorter than eye, the diameter of which is $3\frac{1}{4}$ to $3\frac{2}{3}$ in the length of head. Interorbital width equal to or a little longer than the postorbital part of head. 27 to 29 scales in a longitudinal series. Dorsal 8-9; origin equidistant from end of snout and posterior part (♀) or middle (♂) of caudal fin; free edge a little convex, the second branched ray the longest. Anal 8-9; origin below or a little behind that of the dorsal. Pectoral shorter than the head, extending to above anterior part of pelvics (♀). Caudal rounded. Least depth of caudal $\frac{2}{3}$ to $\frac{3}{4}$ the length of head. Olivaceous; a black spot at the base of the dorsal fin.

San José.

Six specimens, 32 to 52 mm. in total length.

This species may not be distinct from *P. tenuis*, Meek, which is described as having a longer body (depth 4 to $4\frac{1}{2}$ in the length) and smaller scales (31 in a longitudinal series). *P. caucana*, Steind., seems to differ in the larger eye, $2\frac{1}{2}$ to 3 in the length of head in specimens of 32 to 43 mm.

- III. Origin of anal below fourth or fifth dorsal ray; origin of dorsal equidistant from end of snout and base of caudal; 28 to 30 scales in a longitudinal series 10. *petenensis*, Günth., [1866.]
- IV. Origin of anal below the middle of dorsal; origin of dorsal equidistant from end of snout and anterior part of caudal; 23 to 27 scales in a longitudinal series.
- Depth of body about $2\frac{3}{4}$ in the length, length of head about 4 (in specimens of 50 mm.) .. [1859.]
- Depth of body 2 to $2\frac{2}{3}$ in the length, length of head $3\frac{1}{3}$ to $3\frac{2}{3}$ (in specimens of 60 mm.) .. 11. *couchiana*, Girard, [1866.]
12. *maculata*, Günth.,

Mugilidæ.

11. *Agonostomus percoides*, Günth.

Rio Iroquois.

Two specimens: one of 135 mm. in every way similar to the type of the species; the other, 270 mm. in total length, with thick upper lip.

XENORHYNCHICHTHYS, gen. nov.

Differs from *Joturus*, Poey, in the absence of teeth on the palatines and pterygoids.

12. *Xenorhynchichthys stipes*, Jord. & Gilb.

This species has been placed by Jordan and Evermann in the synonymy of *Joturus pichardi*, Poey, but it is quite distinct. In the type of *Agonostomus globiceps*, Günth., which seems to be identical with *J. pichardi*, the vomerine teeth form a triangular patch, bands of teeth are present on palatines and pterygoids, the snout is vertically truncated, and the maxillary extends a little beyond the vertical from the anterior edge of the eye.

In four young specimens of *X. stipes*, 150 to 190 mm. in total length, from the Rio Iroquois, the vomerine teeth form a transverse ovate patch, there are no palatine and pterygoid teeth, the snout is obliquely truncated, and the maxillary extends to below the middle of the eye. In these examples the soft dorsal, anal, and caudal fins have large blackish spots or oblique bars. As in *J. pichardi* the anal fin is formed of II 11 rays, the first spine very small, the two first articulated rays unbranched.

Cichlidæ.

13. *Cichlosoma septemfasciatum*, sp. n.

Depth of body $1\frac{4}{5}$ to $2\frac{2}{5}$ in the length, length of head 3 to $3\frac{1}{3}$. Snout as long as or shorter than postorbital part of

head. Diameter of eye $3\frac{1}{2}$ to 4 in the length of head, interorbital width $2\frac{2}{3}$ to 3. Depth of præorbital equal to or less than the diameter of eye. Jaws equal anteriorly; maxillary not extending to below the eye; fold of the lower lip not continuous; anterior teeth in both jaws somewhat enlarged; cheek with 3 to 5 series of scales; 5 or 6 gill-rakers on the lower part of the anterior arch. 28 or 29 scales in a longitudinal series, 4 or $4\frac{1}{2}$ in an oblique series downwards and backwards from origin of dorsal fin to lateral line, $1\frac{1}{2}$ to $2\frac{1}{2}$ between lateral line and scaly sheath at base of soft dorsal. Dorsal XVII-XVIII 8-10, commencing above the opercular cleft, the spines subequal from the fifth or sixth to the fifteenth or sixteenth, the last $\frac{2}{3}$ to $\frac{1}{2}$ the length of head; soft fin, when laid back, extending nearly to the middle of caudal or beyond. Anal VIII-X 7-8. Pectoral nearly as long as the head, extending to above the anal; outer ray of pelvic fin produced. Caudal rounded. Caudal peduncle $\frac{1}{2}$ to $\frac{2}{3}$ as long as deep. Body with seven dark cross-bars, of which the third, on the middle of the side, and the last, on the caudal peduncle, are much more strongly marked than the rest; fins without spots.

Rio Iroquois.

Fourteen specimens, 60 to 100 mm. in total length.

This species is very close to *C. spilurum*, which has $5\frac{1}{2}$ or 6 scales between the origin of the dorsal fin and the lateral line, the dorsal spines usually higher, the last $\frac{1}{2}$ to $\frac{2}{3}$ the length of head, and the body crossed by 7 vertical bars of equal strength, the last joining the ends of the soft dorsal and anal and followed by a vertically expanded spot at the base of the caudal fin.

14. *Cichlosoma lethrinus*, sp. n.

Depth of body about $2\frac{1}{3}$ in the length, length of head $2\frac{2}{3}$ to 3. Snout as long as or a little longer than postorbital part of head, with straight oblique profile. Diameter of eye $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length of head, interorbital width 3 to $3\frac{1}{2}$. Depth of præorbital $\frac{4}{5}$ to $1\frac{1}{2}$ the diameter of eye. Jaws equal anteriorly; maxillary not extending to below the eye; fold of the lower lip not continuous; teeth of the outer series in both jaws moderate, gradually decreasing in size laterally; cheek with 5 series of scales; 8 gill-rakers on the lower part of the anterior arch. 29 to 31 scales in a longitudinal series, 4 or $4\frac{1}{2}$ in an oblique series downwards and backwards from origin of dorsal to the lateral line, $2\frac{1}{2}$ between lateral line and scaly sheath at base of anterior part of soft dorsal. Dorsal XVII-XVIII 10-12, commencing above the opercular cleft,

the spines subequal from about the fifth to the fifteenth, the last a little more than $\frac{1}{3}$ the length of head. Anal VI-VII 8-10. Pectoral shorter than the head, extending to above the first or second anal spine. Caudal rounded. Caudal peduncle deeper than long. Body with 6 dark cross-bars, the two first broad and more or less confluent; a more or less continuous blackish longitudinal band from eye to a spot on the upper part of the base of caudal; vertical fins dusky, the soft dorsal and caudal with series of pale spots.

Rio Iroquois.

Six specimens, 80 to 145 mm. in total length.

Of *C. altifrons*, the nearest ally of this species, I have seen two specimens from the Rio Grande de Terraba. These have 16 dorsal and 5 anal spines and 11 or 12 gill-rakers on the lower part of the anterior arch. The last dorsal spine measures nearly $\frac{1}{2}$ the length of the head and the subcontinuous fold of the lower lip is divided into two deep pendent lobes.

TOMOCICHLA, gen. nov.

Differs from *Herichthys* in having the pelvic fins inserted well behind the pectorals.

15. *Tomocichla underwoodi*, sp. n.

Depth of body $2\frac{1}{2}$ to $3\frac{1}{3}$ in the length, length of head $3\frac{1}{3}$ to $3\frac{3}{4}$. Snout about as long as postorbital part of head. Diameter of eye $4\frac{1}{2}$ to 6 in the length of head, interorbital width $2\frac{1}{3}$ (adult) to 3 (young). Depth of præorbital 1 to $1\frac{1}{2}$ the diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly or the lower a little shorter than the upper; fold of the lower lip continuous; cheek with 4 or 5 series of scales; 9 to 12 gill-rakers on the lower part of the anterior arch. 32 to 35 scales in a longitudinal series, $4\frac{1}{2}$ to $5\frac{1}{2}$ in an oblique series backwards and downwards from origin of dorsal to lateral line, 3 between lateral line and sheath at base of anterior part of soft dorsal. Dorsal XVI 13-15; middle spines subequal; last spine $\frac{1}{3}$ to $\frac{2}{5}$ the length of head; soft fin rounded, when laid back not or scarcely extending to the caudal. Anal IV 9-11. Pectoral $\frac{2}{3}$ to $\frac{4}{5}$ the length of head, not extending to above the anal. Caudal emarginate. Caudal peduncle as long as deep. 6 to 8 blackish cross-bars on the side, chiefly below the lateral line; soft vertical fins with or without series of dark spots, which may form reticulations.

Rio Iroquois.

Thirteen specimens, 120 to 260 mm. in total length.

This species has the dentition of *Herichthys cyanoquttatus*; the latter may be derived from a type similar to *Cichlosoma fenestratum*, with which it agrees in the deep body, strong dorsal spines, interrupted lower lip, insertion of pelvic fins nearly in the vertical from base of pectoral, &c. *Tomocichla underwoodi*, however, has the elongate body, short dorsal spines, and continuous lower lip of *C. godmani*, with which it also agrees in having the insertion of the pelvic fins far behind the base of the pectoral. Steindachner's *Heros lentiginosus* may prove to be a *Tomocichla*.

16. *Paraneetroplus sieboldii*, Kner & Steind.
Rio Grande de Terraba.

Gobiidæ.

17. *Philypnus maculatus*, Günth.
Rio Ballena.

BIBLIOGRAPHICAL NOTICES.

Heredity. By J. ARTHUR THOMSON. London: John Murray, 1908. (Progressive Science Series.) Pp. i-xvi, 1-605.

HEREDITY has always possessed a strange fascination for mankind, though not until recent years has any real grip of the subject been obtained. We have as yet, indeed, done little more than clear a few pathways through the thick undergrowth of tradition and speculation which has grown up during centuries of crude experiment and rule-of-thumb practice.

The work so far accomplished, however, is sufficient to show that the riddle of heredity is one of the most difficult which the biologist has yet attempted to solve. Analyze and experiment as we will, that intangible property of pullulation peculiar to living matter still remains one of Nature's secrets. Whether it will ever be wrested from her time alone will prove, but the attempt is being made, and in earnest. Already an appalling amount of literature on the subject has come into being, not all of which is worthy of the theme. Prof. Thomson, however, set himself the task of sifting and systematizing this output, and that he has been singularly successful in winnowing the chaff from the grain is beyond dispute. The results of his labours are now presented to the world in a volume which will be regarded as the standard work of reference to this subject for some years to come. To the biologist it